3b) $f(x) = x^5$ $g(x) = 2x - 3$

$(g \circ f)(x) = 2(x^5) - 3$

$= 2x^5 - 3$

$(g \circ f)(x) = 10x^4$

ASIDE what is $g(f'(x))$?

$= 2(5x^4) - 3$

$g(x) = 2x - 3$

$g'(x) = 2$

$f(x) = x^5$

$f'(x) = 5x^4$

Chain Rule: $g(f(x))$

$(g \circ f)'(x) = g'(f(x)) \cdot f'(x)$

$= 2|_{x=f(x)} \cdot (5x^4) = 2 \cdot 5x^4 = 10x^4$

$g'(x) = 2$

13) $f(x) = \left(4 + (3x)^{1/2}\right)^{1/2}$

$f'(x) = \frac{1}{2}\left(4 + (3x)^{1/2}\right)^{-\frac{1}{2}}\left(0 + \frac{1}{2}(3x)^{-1/2}(3)\right)$

1 chain rule

second chain rule

6)

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
-1	2	3	2	-3
2	0	4	1	-5

a) find $F'(-1)$, where $F(x) = f(g(x))$

$$F'(x) = f'(g(x)) \cdot g'(x)$$

$$F'(-1) = f'(g(-1)) \cdot g'(-1)$$

$$= f'(2) \cdot (-3)$$

$$= (4) \cdot (-3) = -12$$

$f(x)$ $f'(x)$

$g(x)$ $g'(x)$

b) find $G'(-1)$ where $G'(x) = g(f(x))$

$$G'(x) = g'(f(x)) \cdot f'(x)$$

$$G'(-1) = g'(f(-1)) \cdot f'(-1)$$

$$= g'(2) \cdot (3)$$

$$= (-5) \cdot (3) = -15$$

13) $f(x) = \sqrt{4+\sqrt{3x}} = \left(4+(3x)^{1/2}\right)^{1/2}$

$f'(x) = \frac{1}{2}\left(4+(3x)^{1/2}\right)^{-\frac{1}{2}}\left(\frac{1}{2}(3x)^{-\frac{1}{2}}\right)(3)$

$(3x)^{1/2}$ $\qquad$ $3x$

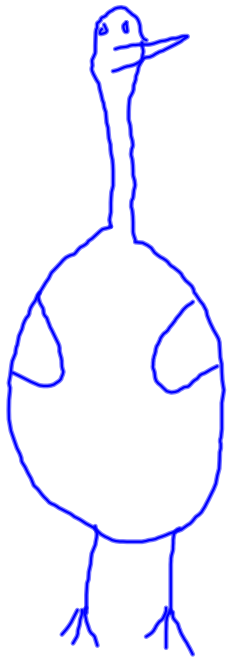
$f(x) = \left(4+(3x)^{1/2}\right)^{1/2}$

$1 \rightarrow 3(1) \rightarrow 4+(3(1))^{1/2} \rightarrow \left(4+3(1)^{1/2}\right)^{1/2}$

$f(x) = x^{1/2}$

$g(x) = \left(4+(3x)^{1/2}\right)$

3.5 homework



2010-10-06 Pd 2

Tre. Cinque

- Sei +1-3+2

6)

x	f(x)	f'(x)	g(x)	g'(x)
-1	2	3	2	-3
2	0	4	1	-5

a) find $F'(-1)$ where $F(x) = f(g(x))$

Chain rule — wir haben ein "composition of" funktion

$$F'(x) = f'(g(x))\, g'(x)$$

$$F'(-1) = f'(g(-1)) \cdot g'(-1)$$

$$= f'(2) \cdot (-3) = (4)(-3) = -12$$

b) $G'(-1)$, where $G(x) = g(f(x))$

Nous avons un "composition of functions"

$$G'(x) = g'(f(x)) \cdot f'(x)$$

$$G'(-1) = g'(f(-1)) \cdot f'(-1) = g'(2) \cdot (3)$$

$$= (-5)(3) = -15$$

7] $r(x) = (x^3+2x)^{37}$ $f(g(x))$

$f(x) = x^{37}$ $f'(x) = 37x^{36}$

$g(x) = x^3+2x$ $g'(x) = 3x^2+2$

11
17
20
9-10
7

$(f(g(x)))' = f'(g(x)) \cdot g'(x)$

$= 37(x^3+2x)^{36} \cdot (3x^2+2)$

1 $\frac{d}{dx}(x^3+2x)^{37}$

$= 37(x^3+2x)^{36} \cdot (3x^2+2)$

9) $f(x) = \left(x^3 - \frac{7}{x}\right)^{-2}$

$f(x) = x^{-2}$ $\quad f'(x) = -2x^{-3} = -\frac{2}{x^3}$

$g(x) = x^3 - \frac{7}{x}$ $\quad g'(x) = 3x^2 + \frac{7}{x^2}$

$-7x^{-1}$

$$\left(f(g(x))\right)' = f'(g(x)) \cdot g'(x)$$

$$= \frac{-2}{\left(x^3 - \frac{7}{x}\right)^3} \cdot \left(3x^2 + \frac{7}{x^2}\right)$$

$$\frac{d}{dx}\left(x^3 - \frac{7}{x}\right)^{-2} = -2\left(x^3 - \frac{7}{x}\right)^{-3}\left(3x^2 + \frac{7}{x^2}\right)$$

10) $f(x) = (x^5 - x + 1)^{-9}$ $\left[\frac{1}{(x^5-x+1)^9}\right]$

$$f'(x) = -9(x^5 - x + 1)^{-10} \cdot (5x^4 - 1)$$

$(x^5 - x + 1)^{-9}$

$f(x) = x^{-9}$ $\quad f'(x) = -9x^{-10}$

$g(x) = x^5 - x + 1$ $\quad g'(x) = 5x^4 - 1$

17) $y = 4\cos^5 x = 4(\cos x)^5$

$y' = 4\left[5(\cos x)^4 \cdot (-\sin x)\right]$

$(4)(\cos x)^5$ <

$f(x) = 4x^5$ $\quad f'(x) = 20x^4$

$g(x) = \cos x$

20 $y = \tan^4(x^3) = (\tan x^3)^4$

$x = 1 \Rightarrow 1^3 \Rightarrow \tan 1 \Rightarrow (\tan 1)^4$

$y' = 4(\tan x^3)^3 (\sec^2(x^3))(3x^2)$

11) $f(x) = \frac{4}{(3x^2-2x+1)^3} = 4(3x^2-2x+1)^{-3}$

$f'(x) = 4\frac{d}{dx}(3x^2-2x+1)^{-3}$ $f(x) = x^{-3}$, $g(x) = 3x^2-2x+1$

$= 4\left[-3(3x^2-2x+1)^{-4}(6x-2)\right]$

$y = f(g(x))$ $y' = f'(g(x)) \cdot g'(x)$

$f(x) = x^{-3} \Rightarrow f'(x) = -3x^{-4}$

$g(x) = 3x^2-2x+1 \Rightarrow g'(x) = 6x-2$

$y' = f'(g(x)) \cdot g'(x)$

$-3(3x^2-2x+1)^{-4} \cdot (6x-2)$

16) $\cos^2(3\sqrt{x^7}) = [\cos(3\sqrt{x^7})]^2$

$3x^{1/2}$

$\frac{d}{dx}\ 3\sqrt{x^7}$

$y' = 2[\cos(3\sqrt{x^7})](-\sin(3\sqrt{x^7}))(\frac{3}{2}x^{-1/2})$

20) $f(x) = \tan^4(x^3) = (\tan(x^3))^4$

$f'(x) = 4(\tan(x^3))^3(\sec^2(x^3))(3x^2)$

21) $2\sec^2(x^7) = 2(\sec(x^7))^2$

$x \to x^7 \to \sec(x^7) \to \sec^2(x^7)$

$f'(x) = 4\sec(x^7)(\sec(x^7)\tan(x^7))(7x^6)$

22) $\cos^3\left(\frac{x}{x+1}\right) = \left[\cos\left(\frac{x}{x+1}\right)\right]^3$

$f'(x) = 3\left[\cos\left(\frac{x}{x+1}\right)\right]^2 \frac{d}{dx}\left(\cos\left(\frac{x}{x+1}\right)\right)$

$= 3\left[\cos\frac{x}{x+1}\right]^2\left[-\sin\left(\frac{x}{x+1}\right)\right]\frac{d}{dx}\left(\frac{x}{x+1}\right)$

$= -3\cos^2\frac{x}{x+1}\sin\left(\frac{x}{x+1}\right)\left(\frac{(1)(x+1)-(x)(1)}{(x+1)^2}\right)$

$= -3\cos^2\frac{x}{x+1}\sin\frac{x}{x+1}\left(\frac{1}{(x+1)^2}\right)$

Challenge

~~$\sqrt{\cos^3(x^7+\sin x^2)}$~~

$\sqrt{\cos^3(x^7+\sqrt{\sin x^2})}$

$= \left[\left(\cos(x^7+(\sin x^2)^{1/2})\right)^3\right]^{1/2}$

3.5 homework

2010-10-07 Pd 3